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TELEVISION TRANSMISSION
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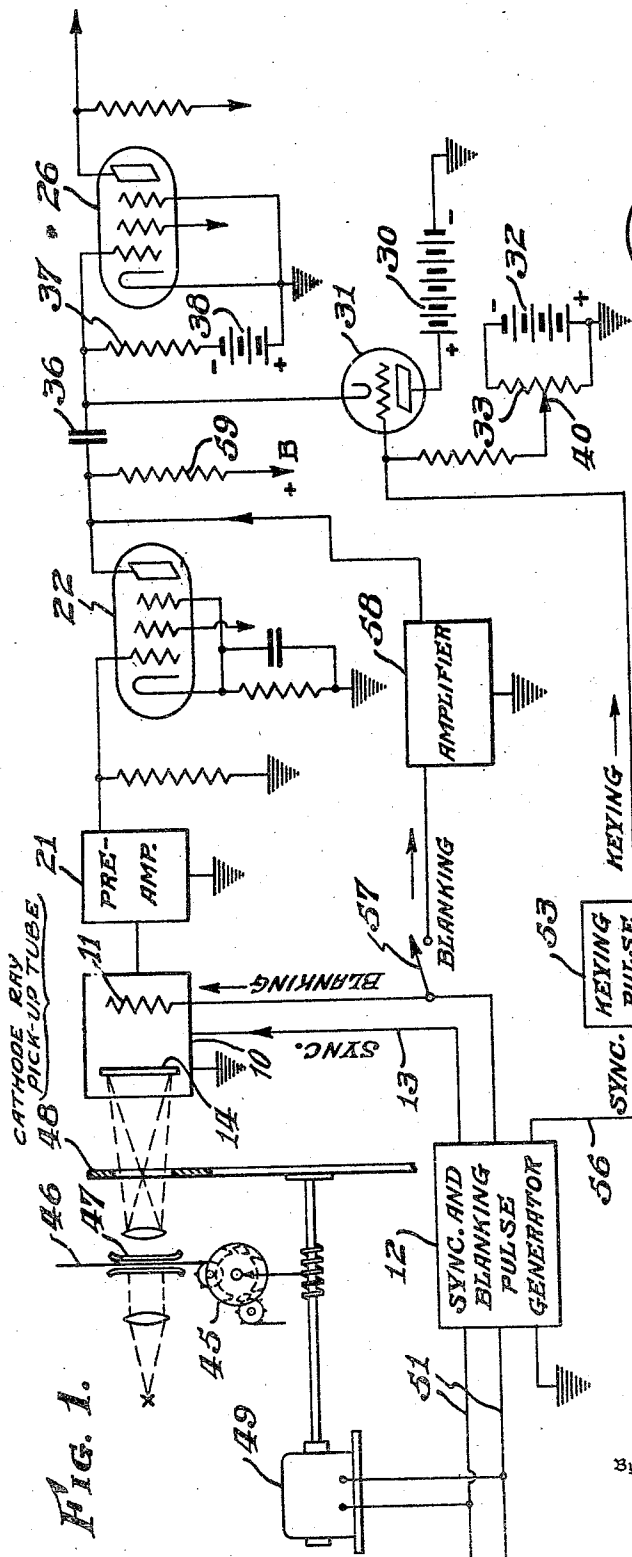


FIG. 2.

FIG. 3.

FIG. 4.

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TELEVISION TRANSMISSION

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2 Claims. (Cl. 178-7.2)

My invention relates to picture transmission and particularly to an improved method of and means for transmitting pictures from motion picture film.

It has been the practice in the television art for some time to produce a signal in which, at the end of each scanning line, there occurs a signal pulse which goes to a definite voltage level such as a voltage representing "black" or "blacker than black" in a picture whereby the direct current component of the signal may be lost and later automatically reinserted.

As described and claimed in Ray D. Kell's application Serial No. 292,790, filed August 31, 1939, for an improvement in Television apparatus, the signal output of a pickup tube of the low velocity beam type may be made to go to such a voltage level by blocking the scanning beam periodically. Specifically, this causes the signal to go to a voltage representing "black" on the mosaic screen of the pickup tube. The synchronizing pulses are later so mixed with the signal that they are added to this black level.

When the subject for transmission is a motion picture film which is being projected upon the mosaic screen of the pickup tube by a projector of the intermittent type, it is the usual practice to project the picture upon the mosaic during the vertical return line period and then scan the mosaic after the projected image has been cut-off by a shutter. This projection of a light image upon the mosaic produces a voltage pulse of fairly large amplitude in the output of the pickup tube during each vertical return line period. Since these pulses have an amplitude which varies with the brightness of the picture image, they may cause an automatic direct current reinserting circuit to become substantially inoperative for correct D.-C. reinsertion if they are permitted to have any controlling effect.

An object of the invention is to provide an improved means for and method of transmitting a picture from a moving picture film.

A further object of the invention is to provide an improved system and method for producing from a moving picture film a television signal which includes the direct current and/or low frequency components.

In a preferred embodiment of the invention, the signal output of a pickup tube of the low velocity type is caused to go to black level periodically by blocking the scanning beam as described in the above-identified Kell application. As previously explained, the output during the return line period will not go to black level when

a film subject is being transmitted but, instead, will go to various levels beyond black. In accordance with my invention, a direct current reinserting circuit is employed which is rendered ineffective during that portion of the return line time that the output signal is a pulse going to an indefinite voltage level. This may be accomplished by producing a keying signal having a duration at least as great as the said pulse and applying it to the D.-C. reinserting circuit.

The invention will be better understood from the following description when taken in connection with the accompanying drawing in which

Figure 1 is a circuit diagram of one embodiment of my invention as applied to a television transmitter, and Figures 2, 3 and 4 are curves which are referred to in explaining the operation of Fig. 1.

Referring to Fig. 1, the invention is shown applied to a television transmitter comprising a low velocity beam pickup tube indicated at 10, which has a control electrode 11. A pulse generator 12 produces synchronizing pulses and blanking pulses.

The synchronizing pulses are supplied over a conductor 13 to the pickup tube 10 for causing the low velocity scanning beam to scan a mosaic screen 14 and thereby produce picture signals.

At the end of each scanning line or horizontal deflection and at the end of each picture frame or vertical deflection, a negative blanking pulse is applied to the control electrode 11 with sufficient amplitude to block the scanning beam. These blanking pulses are shown in Fig. 3.

As a result, the signal output of the pickup tube 10 is like that shown in Fig. 2 where the picture signals produced during a line scanning are indicated at 16. The important characteristic of the output signal is that at the end of each scanning line the signal goes to a value representing "black" in the picture or to a fixed amount beyond "black" in the event that a small fixed amount of illumination on the mosaic screen has been provided for "set-up" as described by Kell, this result being obtained because of the characteristics of the low velocity beam type of pickup tube as explained in the said Kell application. The particular pickup tube which is used in the equipment described preferably is the same as the one shown in Kell's above-identified application.

The output signal shown in Fig. 2 is amplified by a preamplifier 21 and supplied through an amplifier tube 22 to an amplifier tube 26.

In the example herein described, it is desired

to reinsert the direct current component at the input circuit of the amplifier 26. It may be desirable to do this either for more efficient operation of the tube 26 or for the purpose of transmitting the D.-C. component.

The D.-C. reinserting circuit may comprise a triode 31, as illustrated in Fig. 1, which is connected between the grid of tube 26 and ground through a plate supply source 30. A voltage level setting bias for the grid of the tube 31 may be provided in the form of a battery 32 shunted by a potentiometer resistor 33 which has a variable tap 40 thereon.

The signal is applied to the control grid of tube 26 with the black level pulses of negative polarity. These pulses cause current to flow periodically through the triode 31 whereby a direct current charge is applied to the coupling condenser 36. The amount of this charge depends upon the height of a pulse as measured from the alternating current axis of the combined signal.

At the end of each pulse period, the condenser 36 discharges a slight amount through the grid circuit of the tube 26, assuming that tube 31 is not blocked by a negative keying pulse on its grid. The grid circuit of tube 26 includes a grid resistor 37 and a biasing battery 38, the comparatively slow time constant of the discharge circuit being such that the D.-C. bias voltage across the condenser 36 and appearing on the grid of tube 26 will vary in accordance with the said height of the blanking pulses. The operation of D.-C. reinserting circuits of this type is similar to the operation of the circuits described in Willans et al. Patent 2,194,514.

After the signal has passed through the tube 26, synchronizing pulses may be added to the tops of the black level pulses for transmission to the receivers, the tops of these pulses being commonly referred to as "pedestals."

It is assumed that a moving picture projector of the type having an intermittent mechanism 45 is used to project the picture images from a film 46 upon the mosaic screen 14 of the pickup tube 10. The intermittent mechanism 45, which pulls the film through a film gate 47, may be of the 2-3 type for transmitting 24 frames per second film in a system having a scanning frequency of 30 frames per second as described in Bedford Patent 2,082,093. The intermittent 45 and a shutter disc 48 are driven from a synchronous motor 49 which is operated from a power line 51, this being the power line with which the pulse generator 12 is locked in.

Each time an image is projected upon the screen 14, there is produced a rather large pulse in the output signal as indicated at 42 in Fig. 2. It will be apparent that, since this pulse exceeds the black level pulses in amplitude, it will control the action of the D.-C. reinsertion circuit to a large extent unless precautions are taken to prevent this from happening. Accordingly, the triode 47 is rendered ineffective to pass current for the duration of the pulse 42 by means of a keying circuit. The keying circuit comprises a keying pulse generator 53 which supplies negative keying pulses 54 (shown in Fig. 4) to the grid of tube 31 during the presence of pulses whereby tube 47 is blocked periodically. This blocking occurs at the rate of 60 times per second in the specific system illustrated.

The keying pulse generator 53 may be of any suitable type such as one including a blocking

oscillator or a multi-vibrator and suitable clipping or shaping circuits. It may be synchronized by means of synchronizing or blanking pulses supplied from the generator 12 over a conductor 56.

It may be noted that my invention may be employed in a system in which the blanking pulses of Fig. 3 are added to the signal output to permit clipping off any noise that may be present on the black level portion of the signal as described in the Alda V. Bedford application Serial No. 367,888, filed November 30, 1941. Such addition of blanking pulses may be accomplished by closing a switch 57 to connect into the circuit an amplifier 58 having a plate circuit which includes the plate resistor 59 common to amplifiers 58 and 22.

I claim as my invention:

1. In a television system wherein a series of pictures are successively applied at a comparatively low frequency rate to the mosaic of a pickup device including means for directing to said mosaic a beam of electrons which approach zero velocity at their point of impact on said mosaic and have substantially zero velocity in the region of said mosaic when it is unilluminated and wherein a pulse appears in the output signal of said pickup device when each of said pictures is applied to said mosaic, the combination of means for producing periodically recurring electrical pulses occurring at a comparatively high frequency rate, means for blocking said beam of electrons periodically by said pulses whereby the output signal of said pickup device goes periodically to a predetermined amplitude with respect to black in the picture applied to said mosaic, an alternating current coupled circuit through which said output signal is passed whereby the direct current component is lost, means for reinserting said last component in accordance with the height of said signal during said blocking, and means for rendering said reinserting means ineffective for the duration of each pulse produced by the projection of a picture on said mosaic.

2. In a television system, a cathode ray pickup tube of the type having a mosaic of electron emissive capacity elements and having means for producing an electron beam and directing it against said mosaic, the electrons in said beam approaching zero velocity at the point of impact on said mosaic and having substantially zero velocity in the region of said mosaic when it is dark, a moving picture projector for projecting picture frames upon said mosaic whereby a pulse appears in the output signal of said tube each time a frame is projected upon said mosaic, means for producing periodically recurring electrical pulses at line scanning frequency and so applying said pulses to said tube as to periodically block said beam whereby the output signal of said tube goes periodically to a predetermined amplitude level with respect to black in the picture being transmitted, an alternating current coupled circuit through which said output signal is passed whereby the direct current component is lost, means for reinserting said last component in accordance with the height of said signal during said blocking, and means for making said reinserting means ineffective for the duration of each of said pulses caused by projection of picture frames on said mosaic.

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